retraining. After rehabilitation the case patient also demonstrated movement patterns that more closely reflect the patterns of patients without knee pathology and these variables were substantially improved compared to her pre-operative levels. Her knee flexion excursion and knee flexion moment in the operated limb were nearly twice that of the TKA patients who did not undergo the specialized rehabilitation (Figure 1) and she demonstrated a 40% reduction in the adduction moment of her non-operated limb. Her knee excursion symmetry ratio (operated/non-operated limb) was 1.0, whereas the symmetry ratio was 0.7 for the other TKA group.

Table 1. Patient characteristics at all time points

| | Pre-operative | | Initial PT Evaluation | | Discharge from PT | |
|---|---|---|---|---|---|---|
| | Case patient | TKA group (SD) | Case patient | TKA group (SD) | Case patient | TKA group (SD) |
| KOS (%) | 37.14 | 50.28 (17.43) | 32.86 | 55.9 (13.61) | 98.60 | 79.02 (12.35) |
| TUG (s) | 11.1 | 10.2 (2.8) | 14.3 | 11.9 (3.5) | 9.6 | 8.3 (1.9) |
| SCT (s) | 23.4 | 20.3 (9.5) | 36.4 | 26.8 (12.2) | 13.1 | 13.8 (15.1) |
| 6MW (ft) | 1442 | 1487 (410) | 1073 | 1319 (337) | 1709 | 1733 (358) |
| Knee Flexion ROM | 135 | 118 (14) | 95 | 98 (15) | 123 | 115 (11) |
| Quadriceps (N/BMI) | 11.37 | 18.7 (7.5) | 3.91 | 10.0 (4.3) | 12.30 | 17 (6.7) |

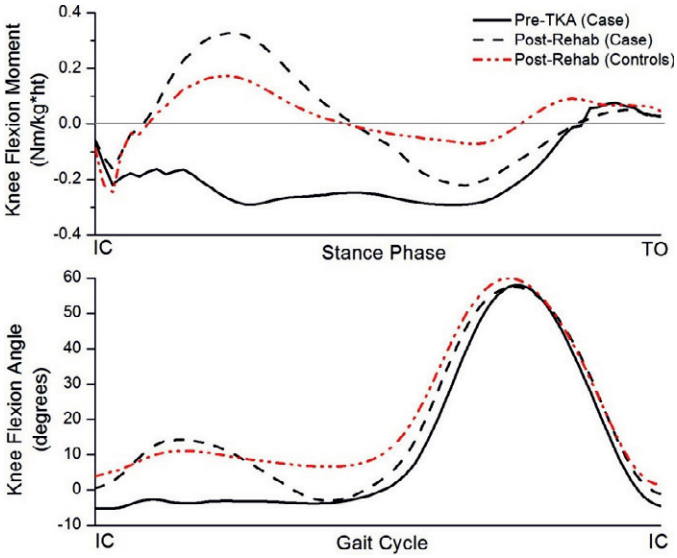


Fig. 1.

**Conclusions:** In this case study, the rehabilitation protocol that focused on improving limb symmetry and normalizing joint motion on the involved leg resulted in dramatic improvements in knee biomechanics and functional outcomes. This restoration of symmetrical and normalized movement patterns may have important implications on reducing the incidence of contralateral joint OA. Future research is warranted to investigate the efficacy of this program on a larger sample of patients after TKA.

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### FOOT CENTER OF PRESSURE MANIPULATION AND GAIT THERAPY INFLUENCE LOWER LIMB MUSCLE ACTIVATION IN PATIENTS WITH OSTEOARTHRITIS OF THE KNEE

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**Purpose:** Foot center of pressure (COP) manipulation has been associated with improved gait patterns. The purpose of this study was to determine lower limb muscle activation changes in knee osteoarthritis patients, both immediately after COP manipulation and when COP manipulation was combined with continuous gait therapy (AposTherapy).
**Methods:** Fourteen females with medial compartment knee osteoarthritis underwent EMG analyses of key muscles of the leg. In the initial stage, trials were carried out at four COP positions. Following this, gait therapy was initiated for three months. The barefoot EMG was compared before and after therapy.
**Results:** The average EMG varied significantly with COP in at least one phase of stance in all examined muscles of the less symptomatic leg and in three muscles of the more symptomatic leg. After training, a significant increase in average EMG was observed in most muscles. Most muscles of the less symptomatic leg showed significantly increased peak EMG. Activity duration was shorter for all muscles of the less symptomatic leg (significant in the lateral gastrocnemius) and three muscles of the more symptomatic leg (significant in the biceps femoris). These results were associated with reduced pain and increased function.
**Conclusions:** COP manipulation influences the muscle activation patterns of the leg in patients with knee osteoarthritis. When combined with a therapy program, muscle activity increases and activity duration decreases.

## Bone Biology

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### LOAD-INDUCED SUBCHONDRAL BONE THICKENING IN MICE WITH OR WITHOUT ARTICULAR CARTILAGE LESIONS

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**Purpose:** Subchondral bone remodelling is an important characteristic of osteoarthritis (OA) in humans and in animal models. However, the relationship between SCB changes and articular cartilage (AC) degeneration remains controversial: do they precede or follow AC lesions? To begin answering this question, we analysed changes in SCB thickness in a mouse model of knee joint loading, in which localised AC lesions are generated in the lateral femur where it becomes closely opposed to the tibia during loading.
**Methods:** Right knees of 8 week-old CBA mice were loaded 3 times each week for 2 (± 3 weeks of normal use with no loads applied) or 5 weeks at a magnitude of 9N as described previously[1+2]. Micro-CT scanning was performed on left (non-loaded) and right (loaded) knee joints and SCB thickness measured in the posterior half of each condyle using CTAn software, and in order to precisely define their spatial relationship to lesions in the lateral femur, in 0.1 mm sections within this posterior half. Paired t-test was used for statistical analysis.
**Results:** SCB thickness was increased in the regions of the lateral femur which were closely associated with load-induced AC lesions, and no changes were noted in regions remote from these lesions. Joints loaded for 5 weeks showed most obvious thickening in SCB. In addition, SCB thickness was increased in the most posterior region of the lateral tibia, where no AC lesions were induced by the application of mechanical loading, but which was directly in contact with the lateral femur AC during loading. This SCB thickening was again most prominent after 5 weeks of loading.
**Conclusions:** We have described focal thickening of SCB associated with load-induced AC lesion formation in the lateral femur, as well as thickening of SCB in areas exposed to direct mechanical loads (without cartilage lesions) in the lateral tibia. This indicates that SCB changes can be induced by loading independently of AC lesions, and that altered load distribution associated with the presence of AC lesions acts to enhance load-induced SCB thickening. These data suggest that SCB thickening is due to altered mechanical loads in OA joints.

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### BLOOD PERFUSION AND BONE FORMATION BEFORE AND AFTER MINIMALLY INVASIVE PERIACETABULAR OSTEOTOMY ANALYSED WITH PET COMBINED WITH CT

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**Purpose:** A new minimally invasive technique for periacetabular osteotomy (PAO) has been developed in our institution. The osteotomized acetabular fragment is reoriented three dimensionally in order to achieve a better acetabular coverage. Bone healing is believed to be completed eight weeks after surgery and from that time, the patients are allowed to fully weight-bear on the operated leg. Sufficient blood perfusion is held to be essential to successful bone healing after PAO. It is never examined in vivo how blood perfusion to the acetabular fragment is affected by